*From* "THE PRACTITIONER" *for June* 1907.

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# ON RETINAL EMBOLISM, WITH TWO CASES IN WHICH A NORMAL STANDARD OF CENTRAL VISUAL ACUITY WAS RETAINED.

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[With Plate XVIII.]

RETINAL embolism is an event which, in the great majority of cases, is signalled by the occurrence of sudden and complete blindness, and this either remains as a permanent condition, or undergoes, in course of time, some slight measure of favourable change.

When this sudden loss of sight has been preceded, on one or more occasions, by temporary visual disturbances or interruptions, the diagnosis of embolism comes more or less definitely under suspicion; and this applies, even although blocking of the central artery is made certain by ophthalmoscopic or other evidences. In such circumstances, thrombosis, endarteritis, and even arterial spasm, have been offered, either alone or in combination, as factors responsible for the vascular obstruction. The suggestion has even been made, that it is in these causes, the majority, if not indeed the whole, of the cases labelled in clinical descriptions "retinal embolism," must find their true explanation. There is, however, reason to suspect that this statement is set in terms too sweeping, as, apart altogether from clinical observations, there is fairly distinct pathological evidence that true embolism of the retinal artery does undoubtedly occur. Whether, in any individual case, this, or alternatively, some other cause of arterial obstruction, is in operation, must be decided by a study of the whole of the attendant circumstances. The question, as a pathological problem, is one of great interest, and its relationships in this respect have recently been very fully discussed by Mr. George Coats,[1] Curator to the Royal London Ophthalmic Hospital, in a paper based upon a series

[1] *Royal London Ophthalmic Hospital Reports*, October, 1905.

of exact histological observations. As a clinical problem, however, the discussion can hardly be of more than academic value, for, given cessation of the blood supply, however produced, the functions of the retina are likely to be permanently damaged, and this, even although the circulation should be restored, after a comparatively brief interval.

In the first of the two cases here recorded (p. 7) the diagnosis of embolism can scarcely be questioned. The dramatic suddenness of the visual loss, the existence of mitral disease, and the ophthalmoscopic facts, taken together, hardly admit of any other interpretation. In the second case there may be reasons for a less confident conclusion. One of these is the absence, so far at least as the patient's judgment goes, of an abrupt or instantaneous character in the onset of the visual defect. Another is the non-existence of any evidence of cardiac or vascular disease from which an embolus could take origin. Yet the case is, beyond doubt, one of arterial occlusion. Hence embolism, thrombosis, and endarteritis appear to be the only possibilities, for spasm *per se*, always a somewhat speculative suggestion, can hardly be proposed as an explanation of arterial obstruction sustained to such a point as permanently to destroy the function of the greater portion of the retina. Now of these three available causes, the comparative youth of the patient (28 years), the absence of any evidence of arterial disease, and the freedom of the personal history from any hint of syphilitic infection, render disease of the wall of the retinal artery in the highest degree improbable. There remain, therefore, thrombosis and embolism. Each of these is not without its difficulties. Against embolism is the absence of any manifest source from which an embolus could readily arise. Against thrombosis are all the circumstances which render endarteritis improbable, for arterial thrombosis is usually, if not invariably, secondary to disease of the vessel wall. Even if the latter consideration be disregarded, it would have to be admitted that a thrombus, formed *in situ*, was a demonstration of an abnormal tendency to blood coagulation. And if this could display itself in the retinal artery, it might equally well do so in some other part of the circulatory apparatus, say in one or other of the chambers of the left heart. The supposition of primary thrombosis may, therefore,

## Plate XVIII.

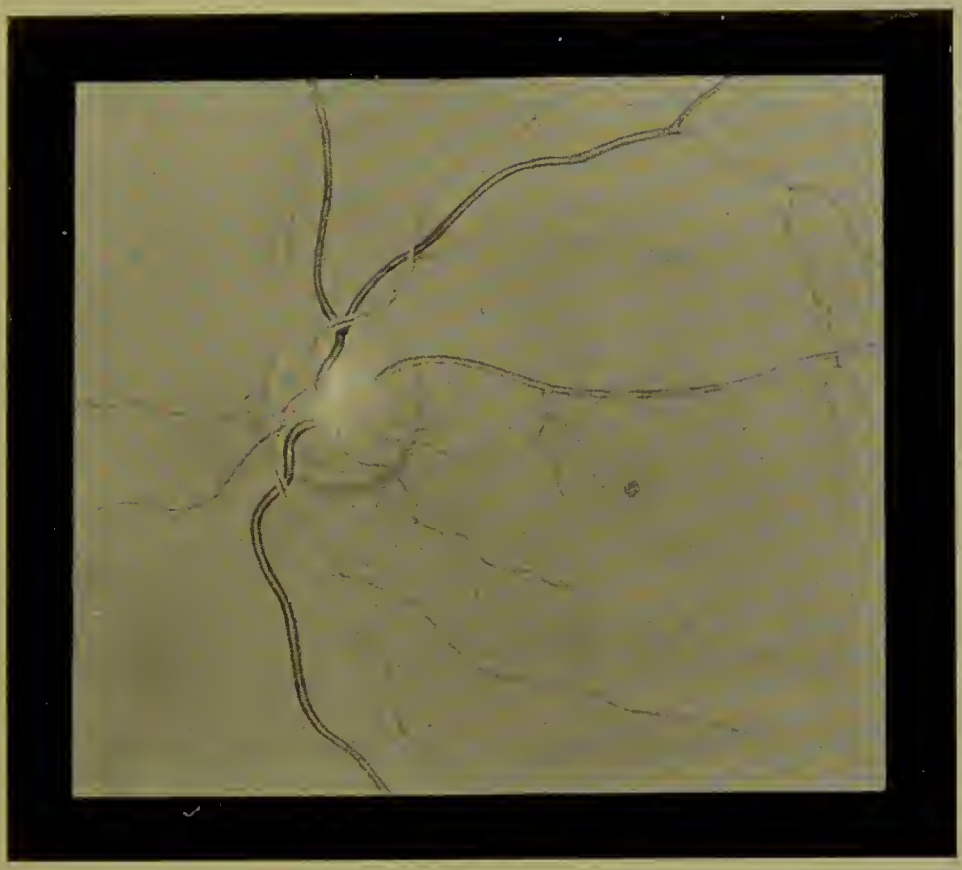

Fig. 1.

Fig. 1.—*Fundus Oculi showing large Cilio-Retinal Artery supplying Macular Region, and Branches of Central Artery much reduced in calibre. Some of the latter have "white lines" along their course, and one, with a downward and inward direction, is practically empty.*

be made to apply as readily to an embolus as to a thrombus, as the cause of obstruction of the retinal artery in a patient free from all evidences of cardiac and vascular disease. Granted this, it may be asked whether any cause for such primary thrombosis can be suggested. Now the examination of the patient reveals no sign of disease other than an anæmia of the chlorotic type. But, although perhaps not very frequent, thrombosis is a recognised complication of chlorosis. Occurring mostly in the veins, or in the intracranial venous sinuses, it does sometimes happen in the arteries. There can thus be little hesitation in admitting that it may also be possible in the chambers of the heart. But a thrombus formed in the heart may be detached, and, if swept from the left auricle or ventricle, may be carried, for example, into the central artery of the retina. Hence there is no reason why a block in this artery, occurring in association with anæmia, should not be due to embolism. In the absence of endarteritis, the block must mean either embolism or thrombosis. And, on the whole, it is perhaps easier to believe that anæmia, with a resulting measure of cardiac dilatation, should give rise to an intra-cardiac thrombosis, than that it should produce an arterial thrombosis apart from primary disease of the vessel wall. In a previous paper,[1] two cases, exactly similar in this respect to Case II. (p. 8), have been reported, and whichever of the two views stated above may be accepted, it is manifest that, among the thrombotic possibilities of anæmia, must be reckoned the occurrence of obstruction of the central artery of the retina, with the clinical consequences associated with the diagnosis of retinal embolism. In the individual case now under discussion (Case II.), the description of the onset of the visual loss, though far from conclusive, may be said to favour thrombosis *in situ* rather than embolism. This comment, however, does not touch, or at least is less appropriate to, the previous records, and, in any event, it must be judged together with the general rebutting evidence already related. Hence the balance of evidence, though allowing some room for uncertainty, seems to favour the diagnosis of embolism, and it is certain that, for ordinary clinical classification, the present case exactly accommodates itself to that diagnosis.

[1] The Practitioner, December 1904.

Assuming then that each of the two cases here recorded is an example of embolism of the central artery of the retina, the most remarkable feature is the retention, in each instance, of a full measure of central visual acuity. Indeed, this peculiarity remains without diminution of interest, even if a thrombus or other agent is substituted for embolus as an explanation of the arterial obstruction. The experience is only too general, that such obstruction carries with it complete loss of sight in the affected eye.

Occasional cases have been recorded, in which, not the whole field, but some limited part of the periphery only has been lost, this being due, presumably, to obstruction, not of the main artery, but of one or more of its terminal branches. On the other hand, there have been instances, in which, with retention of the greater part of the field, there has been a permanent central scotoma, as the result, apparently, of the entry of the obstructing clot into a macular artery, the other vessels of the retinal circulation remaining pervious; and this, as it involves loss of central vision, is almost as disastrous as obstruction of the main vessel. In the present cases, this latter position is reversed. Each patient

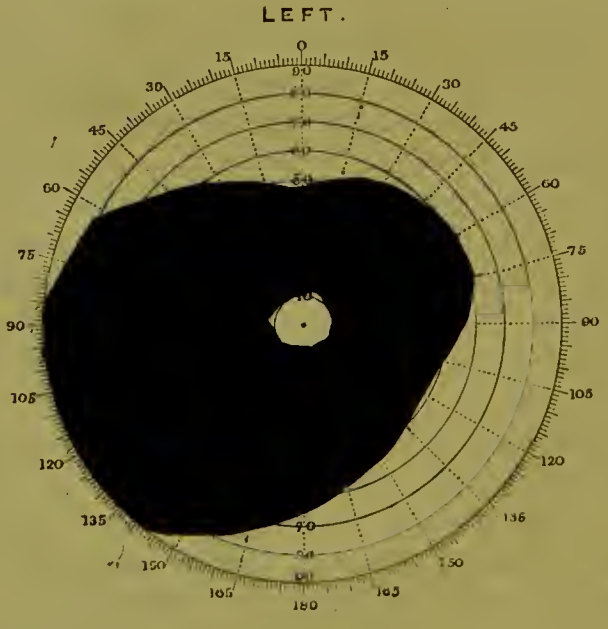


Fig. 2.

Fig. 2.—*Visual field from Case the fundus of which is represented in Fig* 1. *The field is blind except for a small area surrounding the fixation point; here vision is* 6/6 *and J*1.

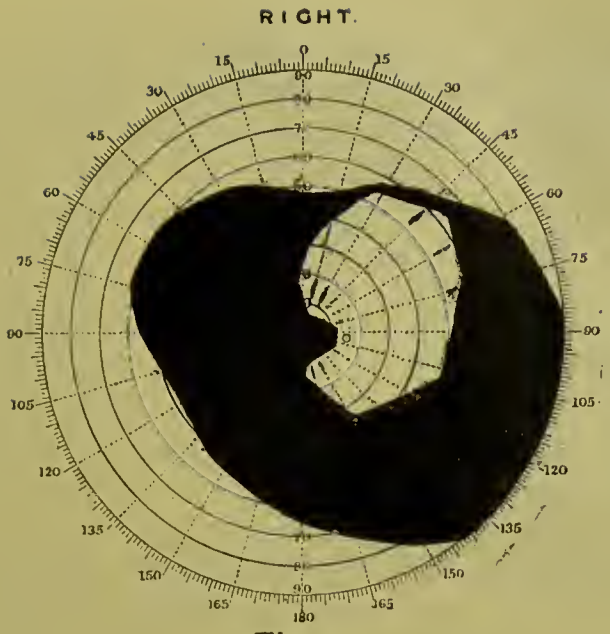


Fig. 3.


Fig. 4.

Figs. 3 *and* 4.—*Visual fields from Cases of Retinal Embolism. The greater part of each field is obliterated, but vision is still possible in a limited area, which, however, is eccentric, and does not include the possibility of central vision. In taking the visual field of an eye deprived of central vision, it is not easy to secure fixation, and hence the definition of the field may be more or less inexact. But if the patient is instructed to place his index finger on the fixation point of the perimeter, and is told to look steadily at the finger, a confident field can, with a little patience, almost invariably be secured.*

has perfect central or direct vision, but the field is restricted to a very limited area surrounding and including the fixation point. Manifestly, therefore, though the blood supply has been cut off from the greater part of the retina, it has remained effective to the macular region. It is perhaps not very uncommon to find, in cases of retinal embolism, that a small part of the field is retained, this being due to a supply of blood reaching, in one way or another, the corresponding part of the retina. The source of this supply may be either a branch from one of the ciliary arteries (cilio-retinal artery), or a branch which takes origin from the central artery in its course in the trunk of the optic nerve.

As the obstruction, whether embolus or thrombus, usually blocks the main artery at the level of the optic papilla, the circulation in a branch, such as the one just described, is not affected, and, consequently, when such a vessel exists, the blood supply, in spite of the block in the central artery, may be continued to a limited portion of the retina. Another possible explanation of the persistence of some part of the field of vision in cases of retinal embolism may be, as suggested by Coats, the establishment of capillary anastomoses between the ciliary and central visual systems. In Figs. 3 and 4 are shown two perimeter tracings from cases of retinal embolism, and each exhibits a small eccentric visual field, the existence of which is to be explained in one or other of the fashions just described. Neither in these nor in other similar instances, as a rule, does the retained portion of the retina include the macular region, and there is, therefore, loss of central vision. In each of the two cases here related, however, there was retention of central vision, and the explanation was evident on ophthalmoscopic examination. As is seen in Fig. 1 (and the two cases presented a practically identical picture), the blood supply of the retina is here not wholly dependent on the central artery. Towards the outer part of the disc is another artery, which is at once recognised as a cilio-retinal vessel, a branch, that is, not of the central artery of the retina, but of the ciliary system. And, manifestly, while the branches of the central artery are greatly reduced in calibre, the blood stream within them having been brought to a standstill and the distending force of the blood pressure being therefore absent, the cilio-retinal vessel is of relatively large calibre, and is in the enjoy-

ment of an active circulation. It is to the presence of this vessel, and to its distribution to the macular region, that retention of central vision is due, while, in consequence of obstruction of the central artery, the whole of the peripheral field is blotted out. The presence of a cilio-retinal artery is, of course, not very uncommon, but it is not always so well developed as here, nor so intimately related to the macular region. Unfortunate, therefore, as these two patients are as victims of retinal embolism, they are to be congratulated upon their escape from the most terrible consequences of that condition, namely, complete and permanent loss of sight in the affected eye. They retain, on the contrary, perfect function in the most important part of the visual field, and for that happy circumstance, they are indebted to the arrangement which has provided each of the affected eyes with a special blood supply to the macular region.

In a previous communication,[1] cases of retinal embolism, homonymous hemianopsia, and optic neuritis, were reported in four women, the subjects of anæmia, and it was argued that these visual disturbances had, in all probability, a common basis in the shape of the thrombus formation which, without question, may complicate the anæmic state, or at least that form of anæmia known as chlorosis. The two cases, which form the basis of the present paper, are, perhaps, mainly of interest as illustrating how, as the result of an unusual vascular supply, an obstruction of the central artery may fail to prejudice central vision. But the second case has this further value, namely, that it emphasises the possible range of the consequences of anæmia through the occurrence of intra-vascular blood-coagulation.

## CASE RECORDS IN ABSTRACT.[2]

*Case I.—Sudden Loss of Sight in Left Eye, Return of Full Visual Acuity but Permanent Contraction of Visual Field; Cilio-Retinal Artery in Affected Eye. Patient the Subject of Mitral Disease.*

Wm. P., æt. 24, was in his usual health when, in November 1903, while at business, he suddenly felt dizzy and exclaimed:

[1] *Loc. cit.*

[2] For the opportunity of observing these cases, I am indebted to the courtesy of my colleagues, Mr. Britten Archer and Mr. Ernest Clarke.

"I have gone blind in my left eye." Seen two days after this occurrence, vision was less than 6/60, and there was some haziness of the edges of the optic disc and an appearance of œdema over the whole of the central region of the fundus. The visual acuity gradually improved and ultimately reached 6/6, and the fundus assumed the appearances represented in Fig. 1, the state of the visual field being shown in the corresponding chart (Fig. 2). Patient was myopic to 2·0 dioptres, but with the corresponding spherical lens was soon able to read 6/6, and J1 at twelve inches. Examination of the chest detected a systolic murmur over the cardiac apex, with accentuation of the second pulmonic sound; patient had an attack of rheumatic fever in 1901. When seen again, in January 1906, the facts showed no alteration in any respect.

*Case II.—Extreme Contraction of Left Visual Field with Retention of Acute Central Vision; Optic Disc pale, with slight evidence of Neuro-Retinitis and Cilio-Retinal Artery. Patient anœmic, but otherwise free from disease.*

Rachel C., æt. 28, suffered from whooping-cough at the end of 1903, and, in December of that year, noticed a sense of "stars shooting and brightness" before the left eye, and followed after a few days by "dulness of sight" in this eye; this "dulness" has proved persistent. When seen in February 1905, V.A. was 6/6 in each eye, the left field was reduced to a small area around the fixation point, and the ophthalmoscopic appearances were practically identical with those figured from the previous case (Fig. 1). Beyond manifest anæmia, no evidence of disease could be discovered. The personal history was one of good health with some want of vigour during the last year or two. Patient the mother of three healthy children; one miscarriage.

General condition much improved under the administration of iron, but no alteration of visual field or ophthalmoscopic appearances to June 1906.